Abstract Submitted
for the SES08 Meeting of
The American Physical Society

Investigating Capacitance Behavior of Nanomaterials through Split-tip Scanning Capacitance Microscopy BEVERLY CLARK III, HANS HALLEN, NCSU Near-field Optics Lab — A split-tip Near-field Scanning Optical Microscope (NSOM) probe is used to measure capacitance. We build a model for the instrument by solving Poisson's equation for a simplified system using the finite element program Femlab. The governing equations and boundary conditions are paramount in obtaining a converging solution. Values obtained from a simple capacitor model are compared to calculated values found from the Scanning Capacitance setup. The split-tip capacitance values will be compared with measured values from the Scanning Conductivity Microscopy (SCM) experimental setup. This scanning probe microscope uses two electrically-isolated electrodes fabricated on one split-tip probe to investigate local electrical behavior of nanostructures. The split-tip probe, which we have recently developed, is optimized for light coupling into a particular region of a nanostructure while non-contact capacitance measurements are simultaneously made between the two electrodes. The capacitance is influenced by the presence of a conducting region on the surface beneath the electrodes. The capacitance coupled or scanning conductivity mode allows rapid characterization of large areas of the sample so that regions of interest can be identified for further study. The finite element model aids in the quantification and understanding of the data.

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Date submitted: 18 Aug 2008 Electronic form version 1.4